

COLONIZATION OF ORNAMENTAL LANDSCAPE PLANTS BY *BEMISIA ARGENTIFOLII* BELLOWS & PERRING (HOMOPTERA: ALEYRODIDAE)

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Abstract.—In a survey of ornamental and landscape plants in the southern San Joaquin valley, we found 82 species representing 42 families that are reproductive hosts of the silverleaf whitefly, *Bemisia argentifolii* Bellows and Perring. Several ornamental plant species were found to be overwintering hosts and some landscape plantings may contribute to infestations in adjacent agricultural areas. Sixty-three ornamental plant species examined did not support silverleaf whitefly colonization or development.

Key Words.—Insecta, host plants, *Bemisia*, silverleaf whitefly, ornamental plants, overwintering hosts

For several years, two populations of the sweetpotato whitefly, *Bemisia tabaci* (Gennadius), in the United States have been distinguished as “strain A” (cotton strain) and “strain B” (poinsettia strain). Perring et al. (1993a) provided evidence that the two strains, although morphologically similar, were distinct species and proposed that the whitefly previously known as *B. tabaci* “strain B” (poinsettia strain) be designated silverleaf whitefly. Bellows et al. (1994) presented additional evidence for considering “strain B” a separate species and proposed the scientific name *Bemisia argentifolii* Bellows and Perring.

Initially confined to southern California, silverleaf whitefly had been found in field situations in three southern San Joaquin Valley counties by December 1991 (Gill 1992). Silverleaf whitefly was reported from most of Kern County during the summer of 1992 (Gruenhagen et al. 1993) and by the summer of 1993, was found extensively throughout Kern, Tulare, Kings and Fresno Counties.

Because *B. argentifolii* is a newly designated species, host lists have not been fully developed. The closely related *B. tabaci* is reported to have over 500 hosts (Mound & Halsey 1978, Greathead 1986) and the host list for *B. argentifolii* may be larger, as *B. argentifolii* appears to have a broader host range than *B. tabaci* (Byrne & Miller 1990, Perring et al. 1992, Gill 1992). Although most *B. argentifolii* host surveys have concentrated on agricultural crops and weeds, many ornamental and landscape plants are susceptible to infestation. Heavy infestations can cause severe injury or death. Whiteflies create a nuisance from the swarming of adults and the production of copious amounts of honeydew. In the San Joaquin Valley, ornamental and landscape plants may serve as overwintering refugia for silverleaf whitefly. Our objectives were to identify ornamental landscape plants that supported colonization and development of *B. argentifolii* and to determine the relative severity of such infestations.

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Table 1. Ornamental and landscape plants found to be hosts of the silverleaf whitefly in a general survey of the southern San Joaquin Valley, California. 1993–94.

Family name ^a	Common name ^a	Scientific name ^a
Apocynaceae	Periwinkle ^b	<i>Vinca</i> sp.
	Oleander ^c	<i>Nerium oleander</i> L.
Araliaceae	Ivy ^b	<i>Hedera</i> sp.
Asteraceae ^d	Chrysanthemum ^c	<i>Chrysanthemum</i> sp.
	Transvaal Daisy	<i>Gerbera jamesonii</i> H. Bolus ex Hook f.
Berberidaceae	Nandina ^{cb}	<i>Nandina domestica</i> Thunberg
Betulaceae	Alder ^b	<i>Alnus</i> sp.
Cannaceae	Canna Lily ^b	<i>Canna</i> sp.
Caryophyllaceae	Sweet William ^b	<i>Dianthus barbatus</i> L.
Euphorbiaceae	Poinsettia ^{cb}	<i>Euphorbia pulcherrima</i> Willdenow ex Klotzsch
Juglandaceae	Black Walnut ^b	<i>Juglans nigra</i> L.
Lamiaceae ^d	Sweet Basil	<i>Ocimum basilicum</i> L.
	Oregano	<i>Origanum vulgare</i> L.
Malvaceae	Hollyhock ^c	<i>Alcea rosea</i> L.
	Hibiscus ^c	<i>Hibiscus rosa-sinensis</i> L.
Rosaceae	Rose ^c	<i>Rosa</i> sp.
	Lady Banks Rose ^{cb}	<i>R. banksiae</i> W. T. Aiton
Solanaceae	Petunia	<i>Petunia hybrida</i> Hort. Vilmorin-Andrieux
Verbenaceae	Lantana ^b	<i>Lantana montevidensis</i> (K. Sprengel) Briquet
Violaceae	Violet	<i>Viola</i> sp.

^a Liberty Hyde Bailey (1976).

^b Host not listed in Mound & Halsey (1978) or Greathead (1986) for *B. tabaci*.

^c Plants on which silverleaf whitefly successfully overwintered in 1992–93 and 1993–94.

^d Asteraceae = Compositae, Lamiaceae = Labiatae.

MATERIALS AND METHODS

Surveys.—During the summer of 1993, we conducted a general survey for silverleaf whitefly throughout the southern San Joaquin Valley. Whitefly infested leaves were placed in zip-lock bags and returned to the laboratory for species identification and evaluation. We confirmed the identity of the whitefly species by examining mature fourth-instar nymphs under a microscope. A plant was considered a reproductive host if we found eggs, immature nymphs, fourth-instar nymphs and exuvia from which adults had emerged. In August 1993, we learned of a commercial nursery in Fresno with a severe whitefly infestation and our initial examination confirmed the presence of *B. argentifolii* based on descriptions developed by T. M. Perring (personal communications). We then conducted a systematic survey of the facility by examining each plant species present. When whitefly nymphs were found, infested leaves were placed in zip-lock bags and returned to the laboratory for species identification and infestation rating. Host status was determined as noted above. Infestation severity was rated on a scale of 1 to 5 where 5 = extremely heavy nymphal populations (> 50 per leaf) and 1 = nymphs present (< 10 per leaf), but sparse. Ratings were based on visual estimates of nymphal density.

During December of 1992 and 1993, we surveyed poinsettia plants in retail outlets in the Fresno area for the presence of live *B. argentifolii*. Leaves were examined with a 10× hand lens and the presence or absence of viable eggs and nymphs noted.

Table 2. Ornamental hosts of silverleaf whitefly found in the survey of a commercial nursery operation. Fresno, California. 1993.

Family name ^a	Common name ^a	Scientific name ^a	Infestation severity ^b
Acanthaceae	Shrimp Plant ^c	<i>Justicia brandegeana</i> Wasshausen & L. B. Smith	3
Aceraceae	Japanese Maple ^c	<i>Acer palmatum</i> Thunberg	3
Anacardiaceae	Chinese Pistache ^c	<i>Pistacia chinensis</i> Bunge	1
Apocynaceae	Oleander ^c	<i>Nerium oleander</i> L.	1
	Dwarf Periwinkle ^c	<i>Vinca minor</i> L.	1
Araliaceae	Variegated Algerian Ivy ^c	<i>Hedera canariensis</i> 'variegata' Willdenow	1
Asteraceae ^d	Blanket Flower ^c	<i>Gaillardia grandiflora</i> Van Houtte	1
	Chrysanthemum	<i>Chrysanthemum</i> sp.	3
	Coreopsis ^c	<i>Coreopsis lanceolata</i> L.	1
Berberidaceae	Nandina ^c	<i>Nandina domestica</i> Thunberg	2
Betulaceae	White Birch ^c	<i>Betula pendula</i> Roth	1
Bignoniaceae	Trumpet Creeper ^c	<i>Campsis radicans</i> (L.) Seemann ex Bureau	2
	Desert Willow ^c	<i>Chilopsis linearis</i> (Cavanilles) Sweet	1
	Pink Dawn ^c	<i>Chitalpa</i> sp.	2
	Cat's Claw ^c	<i>Macfadyena unguis-cati</i> (L.) A. Gentry	1
Cannaceae	Canna Lily ^c	<i>Canna</i> sp.	2
Caprifoliaceae	Old Fashion Weigela ^c	<i>Weigela florida</i> (Bunge) A. de Candolle	2
	Pink Abelia ^c	<i>Abelia grandiflora</i> (André) Rehder	3
	Laurustinus ^c	<i>Viburnum tinus</i> L.	1
Cornaceae	Western Dogwood ^c	<i>Cornus nuttallii</i> Audubon	1
	Kousa Dogwood ^c	<i>C. kousa</i> Hance	2
Ericaceae	Azalea ^c	<i>Rhododendron</i> sp.	2
Euphorbiaceae	Chinese Tallow Tree ^c	<i>Sapium sebiferum</i> (L.) Roxburgh	2
Fabaceae ^d	Snail Vine ^c	<i>Vigna caracalla</i> (L.) Verdcourt	3
	Western Redbud ^c	<i>Cercis occidentalis</i> Torrey	5
	Happy Wanderer ^c	<i>Hardenbergia violacea</i> (Schneevoogt) F. C. Stern	4
Hypericaceae	Aaron's Beard ^c	<i>Hypericum calycinum</i> L.	1
Laminaceae ^d	Peppermint ^c	<i>Mentha piperita</i> L.	2
	Mealy-Cup Salvia ^c	<i>Salvia farinacea</i> Bentham	1
	Scarlet Sage	<i>S. splendens</i> F. Sellow ex Roeme & Schult	2
	Pineapple-Scented Sage ^c	<i>S. elegans</i> Vahl	3
Lauraceae	Grecian Laurel ^c	<i>Laurus nobilis</i> L.	3
Loganiaceae	Butterfly Bush ^c	<i>Buddleia davidii</i> Franchet	3
Lythraceae	Crape Myrtle ^c	<i>Lagerstroemia indica</i> L.	2
	False Heather	<i>Cuphea hyssopifolia</i> von Humboldt, Bonpland & Kunth	3
Magnoliaceae	Saucer Magnolia ^c	<i>Magnolia soulangiana</i> Soulange-Bodin	2
	Tulip Tree ^c	<i>Liriodendron tulipifera</i> L.	1
Malvaceae	Hibiscus	<i>Hibiscus rosa-sinensis</i> L.	5
	Rose of Sharon ^c	<i>H. syriacus</i> L.	5
	Blue Hibiscus ^c	<i>Alyogyne huegelii</i> (Endlicher) Fryxell	3

Table 2. Continued.

Family name ^a	Common name ^a	Scientific name ^a	Infestation severity ^b
	Chinese Lantern	<i>Abutilon hybridum Hortorum</i>	4
	Globe Mallow ^c	<i>Sphaeralcea ambigua</i> A. Gray	3
Moraceae	Fig ^e	<i>Ficus carica</i> L.	2
Myrtaceae	Myrtle ^c	<i>Myrtus communis</i> L.	2
	Eucalyptus ^c	<i>Eucalyptus</i> sp.	2
	Silver Dollar Eucalyptus ^c	<i>E. cinerea</i> F. J. Mueller ex Ben- tham	1
Oleaceae	Forsythia	<i>Forsythia intermedia</i> Zabel	2
Plumbaginaceae	Cape Leadwort ^c	<i>Plumbago auriculata</i> de Lamarck	2
	Dwarf Plumbago ^c	<i>Ceratostigma plumbaginoides</i> Bunge	1
Polygonaceae	Silver Lace Vine ^c	<i>Polygonum aubertii</i> L. Henry	1
Punicaceae	Dwarf Pomegranate	<i>Punica granatum</i> 'nana' (L.) Per- soon	3
Ranunculaceae	Columbine ^c	<i>Aquilegia hybrida</i> Sims	1
Rosaceae	Rose	<i>Rosa</i> sp.	2
	Lady Banks Rose ^c	<i>R. banksiae</i> W. T. Aiton	2
	Bridal-Wreath ^c	<i>Spiraea vanhouttei</i> (C. Briot) Zabel	2
	Spiraea ^c	<i>S. bumalda</i> Burvenich	2
	Spiraea ^c	<i>S. bullata</i> Maximowicz	2
	Indian Mock Strawberry	<i>Duchesnea indica</i> (Andrews) Focke	3
	Pearlbush ^c	<i>Exochorda macrantha</i> (Hort. Li- moine) C. K. Schneider	1
	Flowering Almond ^c	<i>Prunus triloba</i> Lindley	1
Rubiaceae	Gardenia	<i>Gardenia jasminoides</i> Ellis	1
Salicaceae	Pekin Willow ^c	<i>Salix matsudana</i> G. Koidzumi	2
Sapindaceae	Golden Rain Tree ^c	<i>Koelreuteria paniculata</i> Laxmann	2
Saxifragaceae	French Hydrangea ^c	<i>Hydrangea macrophylla</i> (Thunberg) Seringe	1
Scrophulariaceae	Beard-Tongue ^c	<i>Penstemon</i> sp.	2
	Monkey Flower ^c	<i>Mimulus longiflorus</i> (Nuttall) A. L. Grant	1
Solanaceae	Blue Potato Bush ^c	<i>Solanum rantonnetii</i> Carrière	4
	Yesterday-Today-Tomorrow ^c	<i>Brunfelsia pauciflora</i> (Chamisso & Schlechtendal) Bentham	3
Sterculiaceae	Bottle Tree ^c	<i>Brachychiton populneus</i> (Schott & Endlicher) R. Brown	2
Verbenaceae	Lantana ^{ce}	<i>Lantana montevidensis</i> (K. Sprengel) Briquet	5
	Chaste Tree	<i>Vitex agnus-castus</i> L.	5
Vitaceae	Grape ^{ce}	<i>Vitis vinifera</i> L. 'Harmony'	3

^a Liberty Hyde Bailey (1976).

^b 1 = Sparse, 2 = Light, 3 = Moderate, 4 = Heavy, 5 = Extremely Heavy.

^c Hosts not listed by Mound & Halsey (1978) or Greathead (1986) for *B. tabaci*.

^d Asteraceae = Compositae, Lamiaceae = Labiatae, Fabaceae = Leguminosae.

^e Listed as a host by Bellows et al. (1994).

Population Counts and Overwintering.—Selected landscape plants at a rural residence near Five Points, Fresno County, were examined periodically during the winter of 1993-94 to determine the status of silverleaf whitefly populations. Leaves were collected and the number of whitefly nymphs present were counted over a 10 min period. The counts were used as an indication of population status.

Table 3. Ornamental plants on which silverleaf whitefly was not found in the survey of a commercial nursery operation. Fresno, California. 1993.

Family name ^a	Common name ^a	Scientific name ^a
Agavaceae	Tuberose	<i>Polianthes tuberosa</i> L.
Amaryllidaceae	Lily-of-the-Nile	<i>Agapanthus</i> sp.
Anacardiaceae	California Pepper Tree	<i>Schinus molle</i> L.
Apocynaceae	Star Jasmine	<i>Trachelospermum jasminoides</i> (Lindberg) Maire
Aquifoliaceae	Hybrid Holly	<i>Ilex meserveae</i> S. Y. Hu
Araliaceae	English Ivy	<i>Hedra helix</i> L.
Arecaceae ^b	Queen Palm	<i>Arecastrum romanzoffianum</i> (Chamisso) Beccari
Asteraceae ^b	Coyote Bush	<i>Baccharis pilularis</i> de Candolle
	Coreopsis	<i>Coreopsis verticillata</i> L.
	Gray-Leaved Euryops	<i>Euryops pectinatus</i> Cassini
Berberidaceae	Japanese Barberry	<i>Berberis thunbergii</i> de Candolle
Betulaceae	White Alder	<i>Alnus rhombifolia</i> Nuttall
Bignoniaceae	Princess Tree	<i>Paulownia tomentosa</i> (Thunberg) Steudel
	Argentine Trumpet Vine	<i>Clytostoma callistegioides</i> (Chamisso) Bureau
Buxaceae	Boxwood	<i>Buxus microphylla</i> Siebold & Zuccarini
	Japanese Boxwood	<i>B. m. japonica</i> (Müller) Rehder & E. H. Wilson
	Japanese Spurge	<i>Pachysandra terminalis</i> Siebold & Zuccarini
Caryophyllaceae	Carnation	<i>Dianthus caryophyllus</i> L.
Celastraceae	Spindle Tree	<i>Euonymus japonica</i> Thunberg
Cistaceae	Rock Rose	<i>Cistus purpureus</i> Lamiae
Cornaceae	Japanese Laurel	<i>Aucuba japonica</i> Thunberg
Fabaceae ^b	Chinese Wisteria	<i>Wisteria sinensis</i> (Sims) Sweet
Fagaceae	Northern Red Oak	<i>Quercus rubra</i> L.
Geraniaceae	Geranium	<i>Pelargonium</i> sp.
Hamamelidaceae	Sweet Gum	<i>Liquidambar styraciflua</i> L.
Lamiaceae ^b	Jerusalem Sage	<i>Phlomis fruticosa</i> L.
	English Lavender	<i>Lavandula angustifolia</i> Miller
	Rosemary	<i>Rosmarinus officinalis</i> L.
Lauraceae	Camphor Tree	<i>Cinnamomum camphora</i> (L.) J. Presl
Liliaceae	Daylily	<i>Hemerocallis</i> sp.
	Mondo Grass	<i>Ophiopogon japonicus</i> (Thunberg) Ker-Gawler
	'Myers' Asparagus Fern	<i>Asparagus densiflorus</i> (Kunth) Jessop
Magnoliaceae	Southern Magnolia	<i>Magnolia grandiflora</i> L.
Melastomataceae	Princess Flower	<i>Tibouchina urvilleana</i> (de Candolle) Cogniaux
Myrtaceae	Pineapple Guava	<i>Feijoa sellowiana</i> O. Berg
	Weeping Bottlebrush	<i>Callistemon viminalis</i> (Solander ex Gaertner) Cheel
Oleaceae	Pink Flowering Jasmine	<i>Jasminum polyanthum</i> Franchet
	Wax-Leaf Privet	<i>Ligustrum japonicum</i> Thunberg
	Common Lilac	<i>Syringa vulgaris</i> L.
Pinaceae	Mugo pine	<i>Pinus mugo</i> Turra
	Japanese Black Pine	<i>P. thunbergiana</i> Franco
	Colorado Blue Spruce	<i>Picea pungens</i> Englemann
	White Fir	<i>Abies concolor</i> (Gordon) Lindley ex Hildebrand
Pittosporaceae	Mock Orange	<i>Pittosporum tobira</i> (Thunberg) Aiton
Poaceae ^b	Bamboo	<i>Bambusa</i> sp.
Podocarpaceae	African Fern Pine	<i>Podocarpus gracilior</i> Pilger
Proteaceae	Spider Flower	<i>Grevillea</i> sp.
Rosaceae	Photinia	<i>Photinia fraseri</i> Dress
	Carolina Cherry	<i>Prunus caroliniana</i> (Miller) Aiton
	Cotoneaster	<i>Cotoneaster buxifolius</i> Wallich ex Lindley

Table 3. Continued.

Family name ^a	Common name ^a	Scientific name ^a
	Cotoneaster	<i>C. procumbens</i> G. Klotz
	Japanese Rose	<i>Kerria japonica</i> (L.) deCandolle
	Indian Hawthorn	<i>Raphiolepis indica</i> (L.) Lindley
Rubiaceae	Gardenia	<i>Gardenia jasminoides</i> Ellis
Saxifragaceae	Pink Escallonia	<i>Escallonia rosea</i> Grisebach
Scrophulariaceae	Ceniza	<i>Leucophyllum frutescens</i> (Berlandier) I. Johnston
	Snapdragon	<i>Antirrhinum majus</i> L.
Solanaceae	Cupflower	<i>Nierembergia hippomanica</i> Miers
Strelitziaceae	Bird of Paradise	<i>Strelitzia reginae</i> Aiton
Taxodiaceae	Coast Redwood	<i>Sequoia sempervirens</i> (D. Don) Endlicher
Theaceae	Sasanqua Camellia	<i>Camellia sasanqua</i> Thunberg
Thymelaeaceae	Winter Daphne	<i>Daphne odora</i> Thunberg
Ulmaceae	Chinese Elm	<i>Ulmus parvifolia</i> Jacquin

^a Liberty Hyde Bailey (1976).

^b Arecaceae = Palmae, Asteraceae = Compositae, Fabaceae = Leguminosae, Poaceae = Graminae, Lamiaceae = Labiatae.

RESULTS AND DISCUSSION

We found a total of 82 species from 42 families that supported silverleaf whitefly development (Tables 1 and 2). Only Angiospermae were found to be hosts. We occasionally observed adults resting on Gymnospermae, but found no reproductive colonies associated with this class of plants. Neither Mound & Halsey (1978) nor Greathead (1986) reported any Gymnospermae as a host of *B. tabaci*. With the exception of Canna Lily (Cannaceae, *Canna* sp.), subclass Monocotyledonae, all hosts catalogued were members of the subclass Dicotyledonae. Greathead (1986) lists five families in the Monocotyledonae, but not Cannaceae, as containing hosts of *B. tabaci*. Phylogenetically, hosts were found among the most primitive (e.g., Magnoliaceae) to the most advanced (e.g., Asteraceae) families.

The family Rosaceae, which is among the most pest prone in landscape plantings (Raupp et al. 1985), contained the greatest number of hosts species with eight, followed by Malvaceae with six. Among the families we examined that were represented by two or more hosts and for which infestation severity ratings were taken (Table 2), Verbenaceae ($n = 2$) appears to be the most susceptible with a mean (\pm SE) infestation severity of 5.0 ± 0.0 . Malvaceae ($n = 5$) and Fabaceae ($n = 3$) were next, with a mean infestation severity of 4.0 ± 0.45 and 4.0 ± 0.58 respectively, followed by Solanaceae ($n = 2$) with a severity index of 3.5 ± 0.50 . The severity of the infestation among species within individual families was relative consistent. The mean infestation severity in Rosaceae was 1.8 ± 0.25 with a range of 1 to 3. Malvaceae and Fabaceae each had a range of infestation from 3 to 5.

Thirty-three plant species had populations in the moderate to extremely heavy category while forty-nine supported only light infestations. In the nursery or home landscape, moderate whitefly numbers may render the plants aesthetically unpleasant due to the presence of honeydew and the growth of sooty mold. At the wholesale or retail level, the movement of infested plants serves to spread the infestation to new areas (Byrne et al. 1990). This is particularly true for light infestations that are difficult to detect. Flint et al. (1993) showed that customers

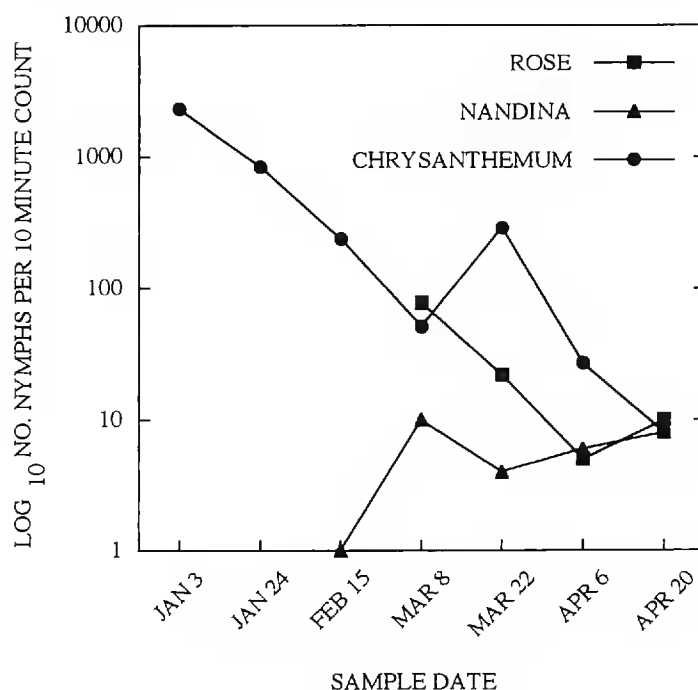


Figure 1. Population levels of *B. argentifolii* on three ornamental plants at a rural Fresno County during winter and early spring, 1994.

ignored or did not recognize some types of pest damage and that some insect infested or damaged plants sold as readily as did clean or undamaged ones.

During the survey of the commercial Fresno facility, we found 63 plant species not infested by silverleaf whitefly (Table 3). The presence of adults is not an indication of host status as many of these non-hosts served as resting sites for the adults.

In our survey of poinsettias in retail outlets in the Fresno area we found infested plants in 14 of 15 and 13 of 15 stores in 1992 and 1993 respectively. Poinsettias often are planted outdoors after Christmas when the threat of frost is past. In June 1993, we found several heavily infested poinsettias that had earlier been transplanted into the yard of a residence near Five Points in western Fresno County.

Ornamentals may play an important role in silverleaf whitefly biology and spread. The poinsettias transplanted into the landscape at the Five Points site were likely the source of infestation for several of the other ornamental species found at that location (Table 1). These plants in turn may have contributed to a major infestation in an adjacent cotton field, approximately 100 meters down wind from the residence. The cotton was heavily infested by July 1993 and counts exceeded 5000 nymphs per 10 min search period in late September (Summers, unpublished data). This was the only infested field within several kilometers of the residence although cotton was abundant in the area. We found viable populations of nymphs on Rose, Nandina, and Chrysanthemum throughout the winter of 1993–94 at the Five Points residence (Fig. 1). Viable nymphs also were observed periodically during the winter on several other species (Tables 1) that likely serve as overwintering hosts. Urban environments and even isolated rural residences usually are slightly warmer than adjacent agricultural areas and may provide ideal overwintering sites. Heat islands are associated with buildings, asphalt and concrete and extend outward into open areas (Duckworth & Sanberg 1954). Homeowners may provide ornamental plants added protection from frost by covering or placing light bulbs near them for additional warmth.

Susceptible ornamentals are not restricted to residential landscaping. Parks, right-of-ways and freeway landscaping frequently contain plants susceptible to silverleaf whitefly. Species commonly used in such plantings include: Indian Mock Strawberry, Western Redbud, Japanese Maple, Dwarf Pomegranate, Laurel, Desert Mallow, Lantana, Chaste Tree, Oleander, Eucalyptus, Rose, and Laurus (Table 2). It may be important to avoid planting highly susceptible species in the future. In both the home landscape and public parks, there exists the likelihood of a nuisance factor from swarming adults, the deposition of honeydew resulting in sticky lawns, automobiles, benches, sidewalks and tables and the growth of sooty mold resulting in unsightly vegetation. In heavily infested hosts, premature leaf dehiscence may occur. Because of *B. argentifolii*'s extensive host range, its propensity to produce large quantities of honeydew (Byrne & Miller 1990) and its high fecundity rate (Bethke et al. 1991) it likely will be a more significant pest in the landscape than was the ash whitefly, *Siphoninus phillyreae* (Haliday), before it was brought under control by introduced natural enemies (Bellows et al. 1992).

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LITERATURE CITED

- Bellows, T. S., T. D. Paine, J. R. Gould, L. G. Bezark, J. C. Ball, W. Bentley, R. Coviello, J. Downer, P. Elam, D. Flaherty, P. Gouvela, C. Koehler, R. Molinar, N. O'Connell, E. Perry & G. Vogel. 1992. Biological control of ash whitefly: a success in progress. *Calif. Agric.* 46(1): 24, 27–28.
- Bellows Jr., T. S., T. M. Perring, R. J. Gill & D. H. Headrick. 1994. Description of a species of *Bemisia* (Homoptera: Aleyrodidae). *Ann. Entomol. Soc. Am.* 87: 195–206.
- Bethke, J. A., T. D. Paine & G. S. Nuessly. 1991. Comparative biology, morphometrics, and development of two populations of *Bemisia tabaci* (Homoptera: Aleyrodidae) on cotton and poinsettia. *Ann. Entomol. Soc. Am.* 84: 407–411.
- Byrne, D. N. & W. B. Miller. 1990. Carbohydrate and amino acid composition of phloem sap and honeydew production by *Bemisia tabaci*. *J. Insect Physiol.* 36: 433–439.
- Byrne, D. N., T. S. Bellows & M. P. Parrella. 1990. Whiteflies in agricultural systems. pp. 227–261. *In* D. Gerling (ed.). *Whiteflies: their bionomics, pest status and management*. Intercept Publications, Wimborne, England.
- Duckworth, F. S. & J. S. Sanberg. 1954. The effect of cities upon horizontal and vertical temperature gradients. *Bull. Am. Meteorol. Soc.* 35: 198–207.
- Flint, M. L., S. H. Dreistadt, E. M. Zagory & R. Rosetta. 1993. IPM reduces pesticide use in the nursery. *Calif. Agric.* 47(4): 4–7.
- Gill, R. J. 1992. A review of the sweetpotato whitefly in Southern California. *The Pan-Pacific Entomol.* 68: 144–152.
- Greathead, A. H. 1986. Host plants. pp. 17–25. *In* M. J. W. Cock (ed.). *Bemisia tabaci—a literature survey on the cotton whitefly with an annotated bibliography*. CAB International Institute of Biological Control, Silwood Park, Ascot Berks., U.K.
- Gruenhagen, N. M., T. M. Perring, L. G. Bezark, D. M. Daoud & T. F. Leigh. 1993. Silverleaf whitefly present in the San Joaquin Valley. *Calif. Agric.* 47(1): 4–6.
- Liberty Hyde Bailey Hortorium. 1976. *Hortus third: a concise dictionary of plants cultivated in the United States and Canada* (3rd ed.). Macmillan, N.Y.

- Mound, L. A. & S. H. Halsey. 1978. Whitefly of the world. British Museum of Natural History and Wiley & Sons, N.Y.
- Perring, T. M., A. Cooper & D. J. Kazmer. 1992. Identification of the poinsettia strain of *Bemisia tabaci* (Homoptera: Aleyrodidae) on broccoli by electrophoresis. *J. Econ. Entomol.* 85: 1278–1284.
- Perring, T. M., A. D. Cooper, R. J. Rodriguez, C. A. Farrar & T. S. Bellows Jr. 1993a. Identification of a whitefly species by genomic and behavioral studies. *Science.* 259: 74–77.
- Perring, T. M., C. A. Farrar, T. M. Bellows, A. D. Cooper & R. J. Rodriguez. 1993b. Evidence for a new species of whitefly: UCR findings and implications. *Calif. Agric.* 47(1): 7–8.
- Raupp, M. J., J. A. Davidson, J. J. Holmes & J. L. Hellman. 1985. The concept of key plants in integrated pest management for landscapes. *J. Arboric.* 11: 317–322.